



# 2008 NIOSH Direct-Reading Exposure Assessment Methods (DREAM) Workshop

November 13 - 14, 2008 ♦ Hilton Crystal City in Washington, D.C.



## Rapporteur Report

### Session 6: Surface Sampling/Biomonitoring

**Monitor:** John Snawder

National Institute for Occupational Safety & Health

**Co-Monitor:** Matthew Magnuson

Environmental Protection Agency

**Rapporteur:** Deborah Sammons

National Institute for Occupational Safety & Health



# Speakers

- Michael Philips
  - Menssanna Research, Inc.
- Charles Timchalk
  - Pacific Northwest National Laboratory
- Jayne Morrow
  - National Institute of Standards and Technology
- Wassana Yantasee
  - Pacific Northwest National Laboratory
- Kevin Ashley
  - National Institute for Occupational Safety and Health



# Surface Sampling

- Surface Sampling

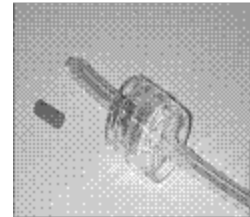
- Types

- Wipes
    - Swabs
    - Tape

Vacuum  
Dermal  
Bulk

- Considerations

- Characteristics of sample
    - Type of surface
    - Transfer of sample
    - Extraction/recovery of sample
    - Matrix of sample



John Snawder

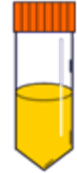


Kevin Ashley



# Biomonitoring

- Biomonitoring
  - Blood
  - Urine
  - Saliva
  - Sperm
  - Tissue
  - Bronchial lavage
  - Exhaled breath
- Assess worker exposure
- Evaluate effectiveness of engineering controls or other exposure reduction/preventive measures





# Chicken or the Egg?

- Surface Sampling
  - Source of contaminant
- Biomonitoring
  - Measured analyte or marker in biological fluid



# Where have we been?

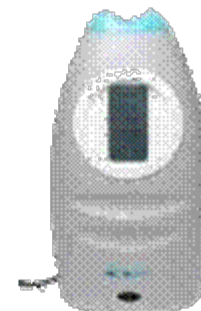
# Where are we going?

- Laboratory Based Analysis
  - Complicated
  - Requires extensive training
  - Expensive
  - Time consuming requiring sending samples out
- Field Portable
  - Convenient for worker (Spirometry)
  - Miniaturized (ELISA- portable spectrophotometers ), but not necessarily real time
- Direct Reading Instruments
  - Real time
  - No or minimal sample preparation
  - Cost effective
  - User friendly but require training



# NIOSH Efforts

- Application of Commercial/ Clinical Point of Care Instruments in the Field
- - TobacAlert- cotinine
  - Testmate AchE- Acetylcholinesterase
  - Avox
  - LeadCare- blood lead
  - Niox- Nitric oxide



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# NIOSH Efforts Development and Commercialization of Kits

- Lead Wipes for surface sampling, NMAM 9105
- Licensed to SKC inc as "Full Disclosure"







# NIOSH Efforts

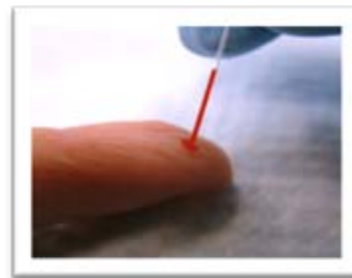
- Methamphetamine surface wipe methods, NMAM Draft 9106,9109,9111 by MassSpec with isotopic dilution.
- 2 Direct Reading Methods, Colorimetric and Immunochemical. Licensed to SKC as "MethAlert" "MethChek"





# NIOSH Efforts Development of Lateral Flow Cassettes

- Anti Protective antigen of *B anthracis* in serum, plasma and whole blood
- Antineoplastic drugs on surfaces
  - Paclitaxol
  - 5-Fluorouracil (5FU)





# Uses of Direct Reading Methods

- Lead hand wipes
- Identification of Exposure/Exposure Assessment
- Evaluation of Cleanup or Controls
- Worker Empowerment

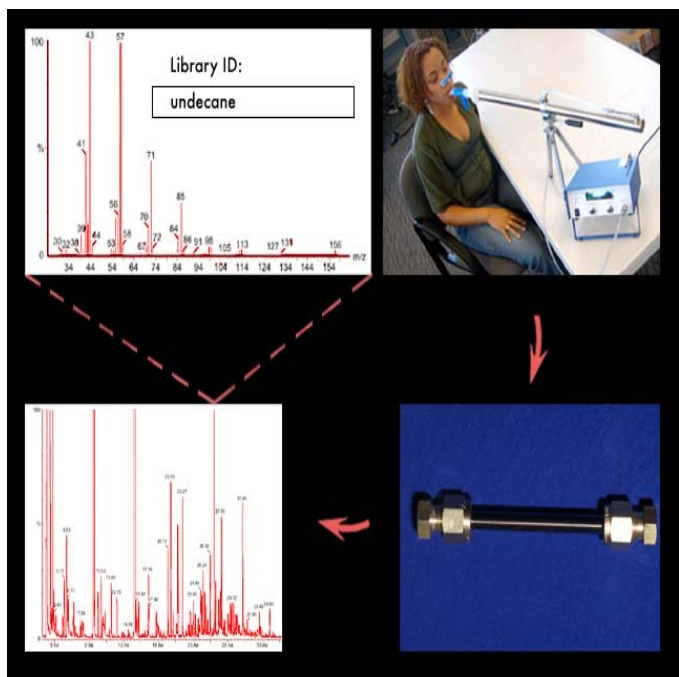
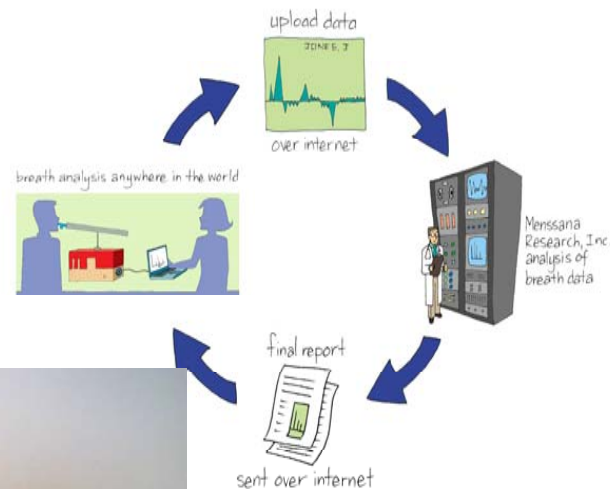
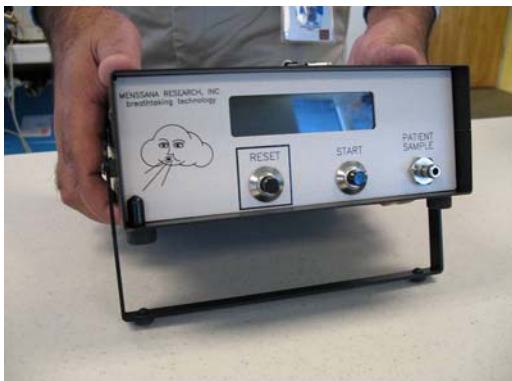


# Advantages/Challenges

- Advantages
  - Low cost
  - Rapid
  - High throughput
  - Sensitive
- Challenges
  - Sampling strategies, reference materials, reference values
  - What do the results mean
  - Field versus lab validation
  - Breath analysis- Regulation nightmare to market products



# Future Applications- VOCs in Exhaled Breath



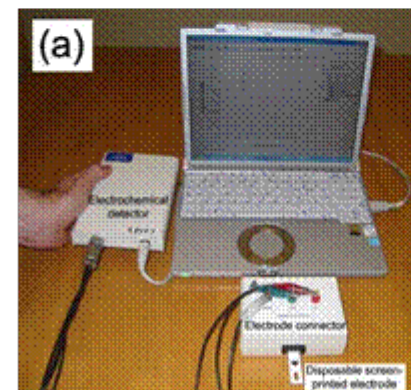
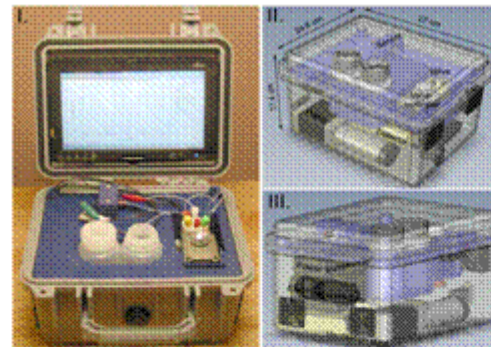


# Future Applications- Electrochemical Sensors for Chemical Mixtures

- Sequential/injection immunoassay for quantitation of trichloropyridinol (metabolite of chlorpyrifos)-ppt
- Carbon nanotube-sensor for quantitation of cholinesterase activity
- Nano-particle immunosensor for phosphorylated AChE

# Future Applications- New Generation Sensors for Pb, Cd, and Hg

- Functional silica (SAMMS) Sensors
  - Self assembled monolayers on mesoporous supports
- Magnetic nanoparticle sensors







# Top Five Research Needs

1. Standardization of instruments and defined performance specifications.
2. Address accreditation issue. DRM/DRI need to be accepted after validation and accreditation, they to be defensible in court. Need a workshop on accreditation and training.
3. Training
4. Know what qualifies as an acceptable DRM or screening method. Need action levels.
5. New biomarkers and sensors. Perhaps partner with something like NIEHS gene environment interaction program. Other medical diagnostic tests used as DRMs. Need means to look at exhaled breath.





# Research Agenda

Stakeholder input to identify top problems

<http://www.cdc.gov/niosh/nora>

Updates on the progress of NORA

<http://www.cdc.gov/niosh/enews/>